

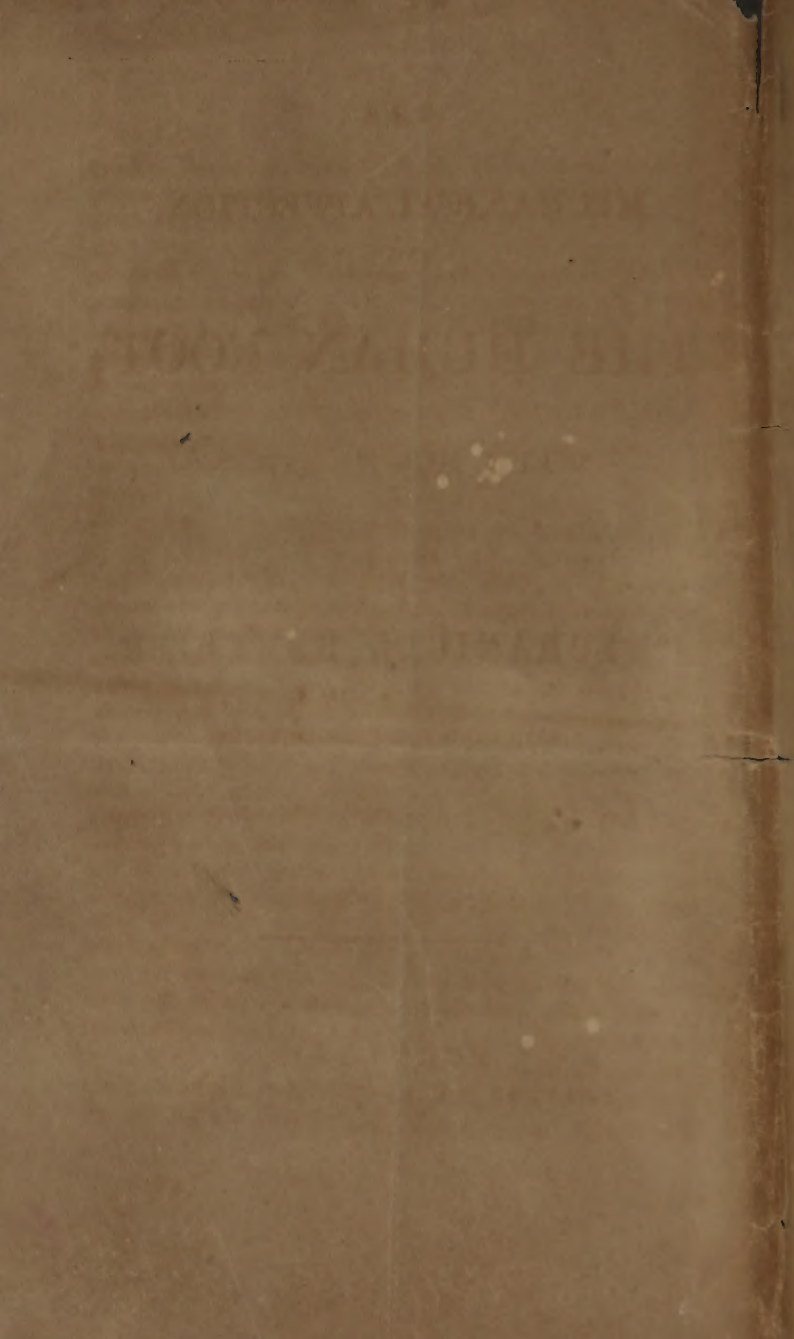
T H E

MECHANICAL AFFECTIONS, AND MECHANICS AND MECHANICAL ANATOMY
 OF THE BONY STRUCTURE OF THE HUMAN FOOT.

Members of the MEDICAL PROFESSION, and scientific men generally, are invited to call at the establishment of
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 Respectfully,
 J. C. PLUMER, M. D., Summer Street, corner of Hawley, Boston.



THE
MECHANICAL AFFECTIONS
OF
THE HUMAN FOOT;
WITH SUGGESTIONS

AS TO THE
MECHANICAL REMEDIES
REQUIRED FOR THEIR RELIEF.

A COMPILATION FROM VARIOUS SURGICAL WORKS, ETC.

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1860.

Swan

MEDICAL ARTICLES

THE HUMAN FOOT

WITH ILLUSTRATIONS

BY

MEDICAL JOURNAL

THE HUMAN FOOT

THE HUMAN FOOT

THE HUMAN FOOT

THE HUMAN FOOT

THE HUMAN FOOT

THE HUMAN FOOT

CLINICAL LECTURES
ON
SURGERY,
DELIVERED AT ST. GEORGE'S HOSPITAL,

BY
SIR BENJAMIN G. BRODIE, BART., V. P. R. S.,
*Sergeant-Surgeon to the Queen; Surgeon in ordinary to his Royal
Highness Prince Albert; &c., &c.*

CHAPTER XIV.

CORNS AND BUNIONS.

"It cannot be doubted that the physical condition of man is, on the whole, much improved by civilization; but it is not so in all respects, and the usages of society are productive of some evil, combined with much good. The evil affects the weaker more than it does the stronger sex; and among the former, those who belong to what are called the higher classes, suffer more than those who belong to the lower. Young ladies, living much in heated rooms, taking little exercise in the fresh air, over-educated as to the acquirement of accomplishments, and using their muscles too little, lose the beautiful figure with which they were endowed by nature, and become afflicted with curvatures of the spine, and weakness and *distortion of the ankles*. [See Fig. 4.]

* * * * *

There is another order of diseases which we meet with more frequently among females of the higher classes than among other persons—namely, *corns and bunions*; and it is to this last humble, but not unimportant subject, that I propose to call your attention in the present lecture.

A corn is in the first instance a thickening of the cuticle. Whenever the cutis is habitually subjected to the influence of

pressure, it secretes a thick and horny cuticle. We find examples of this in the hands of many mechanics, and in the soles of the feet in those who walk much. But every thickening of the cuticle is not a corn, and this name is applicable only to those cases in which the cuticle is thickened over a projecting portion of bone, on which the pressure is, as it were, concentrated. Corns may occur in any part of the body in which this combination of circumstances exists; but, for obvious reasons, they are met with in the feet much more commonly than anywhere else.

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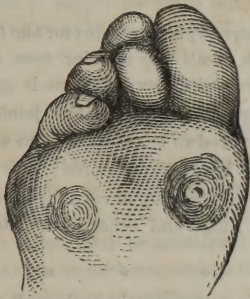
In some cases a hard corn is formed on the lower surface of the foot, over the metatarsal bones. A corn in this situation is especially troublesome, rendering the patient absolutely lame.—
[See Fig. 1.]

* * * * * * *

If shoes were constructed of the *shape of the human foot*, neither *too large nor too small*, and making an equal pressure everywhere, corns and bunions of the feet would never exist. But, unfortunately, shoes are seldom made after this fashion, and in ladies' shoes especially there are generally two signal defects: first, the *extremity of the shoe is much too narrow for that part of the foot* (namely, the toes) which it is to contain; and, secondly, for the purpose of displaying as much of the foot as possible, the whole of the tarsus and metatarsus is left uncovered, and the pressure of the shoe in front is thrown entirely upon the toes. The toes are thus first squeezed against each other, and then pushed out of their natural position; and all the projecting points, chiefly where the joints are situated, are pinched and tormented either by the neighboring toes or by the leather of the shoe, and thus it is that corns of the feet are generated.

In order that you should understand the precise situations in which corns are most likely to take place, you must consider more particularly the effects which the pressure of *the shoe produces on the toes*. The little toe is pushed from its parallel position, so that it is in fact underneath the fourth or adjoining toe, and corns are generated on its outer surface over the prominences

of its joints. A corn is also frequently met with in the angle between the little toe and the next toe, where the first phalanx of the former is pressed against the head of the metatarsal bone supporting the latter. Sometimes the consequence of wearing a very narrow shoe is, that one of the toes (and it is generally the second or fore-toe) is pushed upwards, so that it lies over the two adjoining toes, that is, over the great toe and the third toe, the extremities of which come in contact underneath [See Fig. 1, b, and Fig. 3]; then the leather of the shoe is drawn tight over the upper surface of the second or displaced toe, and corns are produced over one or more of its articulations. [See Fig. 1, b.]



[Fig. 1, a.]



[Fig. 1, b.]

At other times one of the toes (and in this case also it is generally the second toe), is displaced in another way. The extremity of it is pushed downwards, so that it lies beneath the extremities of the two adjoining toes, which come in contact over it. [Fig. 1, a.] But this change cannot take place while the three phalanges of the displaced toe remain in a line with each other. The first and second phalanx make an angle, *projecting upwards*. The second joint of the toe becomes prominent above, and a corn is formed over it. [See Fig. 2.]



[Fig. 2.]

If the shoe, instead of being too narrow, be too short for the foot which it contains, the last phalanges of all the smaller toes are kept constantly in a half-bent state, and a row of corns is generated, one being situated on the upper part of the last joint of each of these toes. I have endeavored to enumerate what may be regarded as the most ordinary localities of corns; but of course they may be produced anywhere else, according to the shape of the shoe, the mode of walking, and other circumstances.

* * * * *

With a view to a *permanent cure*, in some way or other all undue pressure must be removed from the part on which the corn is situated. *First*, the shoe must be made as nearly as possible to the *shape of the foot*, and it must cover the metatarsus and a portion of the tarsus, so that the whole pressure may not be thrown on the toes; or a boot made to be *laced or buttoned* may be worn instead of a shoe. In some cases it is advisable that the shoe or boot should be made, not of ordinary leather, but of very soft and flexible buckskin or cloth.

* * * * *

The first thing to be done for the permanent cure of a soft corn is, that the patient should be provided with a shoe of a proper shape, and that the toes which are in any way displaced should be brought back into their proper position.

The BUNION, which is frequently formed on the inside of the ball (as it is called) of the great toe, differs in some respects from the disease of which I have hitherto spoken.

The great toe ought to be in a line with the metatarsal bone, by which it is supported. But a shoe which is too narrow at its extremity, causes it to incline towards the outside, displacing, in a greater or less degree, the toe next to it, as I have explained already. In some cases, the effect of the pressure on the great toe is actually to alter the position of the joint between it and the metatarsal bone; a portion of the articulating surface on the extremity of the latter being absorbed, and a new articulating surface being made to supply its place more externally than the old one. The existence of these changes I have ascertained by dissection. Now, the consequence of all this is, that the head of the metatarsal bone makes an unnatural prominence, and is more acted on by the pressure of the shoe than it would be otherwise. The cuticle becomes thickened, not at one particular point, but over a considerable surface, and underneath the skin a large and very distinct bursa is generated between it and the bone. The difference between what I have now described and a common corn, may reasonably be attributed to the large size of the head of the first metatarsal bone, and to the consequent diffusion of the pressure over a broad surface.

When a bunion is once formed, the bursa belonging to it is liable to become inflamed after any unusual degree of exercise, or on it being subjected to the pressure of a more than commonly tight shoe. * * * * *

If, however, he continues to walk about, wearing at the same time a tight shoe, the inflammation proceeds further; suppuration takes place, and an abscess is formed. Such an abscess is slow in reaching the surface, and the patient generally suffers severely before it bursts externally; and when it has burst, as the synovial membrane of the bursa granulates with difficulty, the healing of the abscess is very tedious, the parts remaining all the time in a very irritable and painful state.

For the relief of this bunion, when it is free from inflammation,

or inflamed only in a slight degree, the following plan of treatment should be adopted:—the patient should be supplied with a *shoe of sufficient dimensions, of a proper shape, and made of cloth or a soft and pliant leather.*

* * * * *

A tumor is occasionally formed on the instep, which, though not exactly a corn, bears a near relation to it. It is met with in *young men who wear tight boots,* and the usual situation of it is over the articulation, between the internal cuneiform bone and the metatarsal bone of the great toe. The tumor is under the skin, hard and immovable, so that it seems to a superficial observer to be an enlargement of the bone itself. The skin over it is in a natural state, except in cases of long standing, in which the cuticle becomes somewhat thickened.

* * * * *

Such a tumor is productive to the patient of as much inconvenience as a corn, and it requires the same kind of treatment. He should, for a time, *leave off boots altogether* or if he cannot do this, the boot-maker should be directed to provide a last with a projection in that part of it which corresponds to the situation of the tumor, so that the boot may not exercise any pressure on it. A piece of thick buckskin leather, with a hole in it to receive the tumor, will also give the patient immediate relief, and ultimately effect a cure: but the cure, of course, will not be permanent, if he continues to wear *tight boots* afterwards.

THE SCIENCE AND ART OF SURGERY;

BY JOHN ERICHSEN,

*Professor of Surgery and of Clinical Surgery in University College,
and Surgeon to University College Hospital.*

1860.

“ When the bursa that lies towards the plantar surface of the head of the metatarsal bone of the great toe becomes enlarged, or when a new serous sack is formed upon the inner and posterior aspect of this bone, the disease termed **BUNION** occurs. In this affection the enlargement of the bursæ is usually secondary to an alteration in the shape and position of the great toe, which, *in consequence of the pressure of narrow, pointed boots, has been thrown outwards, in an oblique direction, so as to lie over or under some of the contiguous digits.* [See Fig. 3.]



[Fig. 3.]

In this way a sharp angle is formed at the junction between the first phalanx and the metatarsal bone of the great toe. This angle being constantly pressed upon by the boot, becomes irritated, and, for its protection, the bursa that is there naturally situated becomes enlarged, or an adventitious one forms. From

time to time the bursa and the projecting angle become irritated and inflamed; and the morbid action thus set up may run on to a suppuration of a very troublesome kind, a thin, unhealthy pus being formed, which is discharged through an opening that speedily becomes fistulous, and may degenerate into a most troublesome, indolent sore.

* * * * *

In the treatment of the affection, the first thing to be done is to *change the direction of the toe, by wearing properly shaped boots.*

* * * * *

FLAT OR SPLAY FOOT. [See Fig. 4.]

In it there is a tendency, in the first instance, to the obliteration of the arch of the instep, so that the sole becomes perfectly flattened; and as the disease advances, a tendency to eversion of the foot usually takes place. When it has advanced to this extent, the toes and anterior part are often somewhat raised.

* * * * *



[Fig. 4.]

In this kind of deformity, *the ligaments of the sole of the foot, which bind the bones together so as to form the arch, are weakened and elongated.*

* * * * *

A SYSTEM OF PRACTICAL SURGERY.

BY WILLIAM FURGERSON, F. R. S. E.

*Professor of Surgery in King's College, London; Surgeon to
King's College Hospital, etc., etc.*

1843.

“ The great toe and its metatarsal bone are liable to a kind of displacement of a *slow and gradual character*, constituting a condition whose real nature has occasionally been overlooked. The disease is termed “ bunion.” In some individuals the distal extremities of the metatarsal bones have a considerable tendency to separate from each other ; and as more latitude of movement is permitted on the outer and inner margin of the foot than in the other bones, any inconvenience which may result therefrom is experienced in these situations. The distal extremity of the metatarsal bone of the little toe is occasionally somewhat prominent, but seldom causes much inconvenience ; in the great toe, however, the spreading out of the foot causes the end of the metatarsal bone to appear so prominent, that this condition is often mistaken for an organized tumor on the inside of the articulation. The swelling is occasioned almost solely by the end of the metatarsal bone, whose projection inwards is rendered conspicuous by displacement of the toe itself, which slopes off from the metatarsal bone towards the other toes, so as to make the distortion more prominent. The feet of the female opera-dancer are always distorted in this way ; the displacement being, doubtless, occasioned by the frequent habit of poisoning the body on this member, and thus producing a “ fantastic toe,” of a very different description from that to which the phrase usually has reference. The skin over the projection is generally thinner than in the natural condition, the internal lateral ligament more elongated; and in some instances the head of the bone is enlarged ; it occasionally happens, however, more particularly during inflammation of the sur-

face,—a condition to which it is remarkably subject, in consequence of pressure,—that the soft parts actually seem to be thicker than in the natural state. The inflammation may be in the skin only; it may, however, extend to the joint, or in some instances its effects may be most conspicuous in a bursa, which is sometimes present in this situation. The disease is exceedingly troublesome, more particularly if ulceration is present,—an event which is by no means unusual,—for then even the slightest pressure (which is at all times annoying) cannot be borne; but unless the joint becomes permanently affected, no active surgical means beyond those usually adopted in local inflammations are required; rest and horizontal position will be of the utmost consequence if the latter disease be in a state of activity, and, under ordinary circumstances, a *shoe made of soft upper leather, and so constructed as to save the part from pressure, should always be worn*; no further special instructions seem necessary here, and I will therefore only caution the young surgeon not to mistake a swelling of this kind for a tumor of another character, and resort to an operation for its removal, which will reflect great discredit on his professional character.

The drawing exhibits an example of the kind of swelling referred to.



[Fig. 5.]

The tumor in this case was slightly inflamed, but there was no ulceration present. There are few feet where such a projection is not more or less conspicuous, and that here exhib-

ited is below the average size of what is so familiarly known under the title of BUNION ; it seems, therefore, sufficiently strange that the true nature of the disease should ever be mistaken ; for in many instances the skin over the end of the metatarsal bone is actually so thin as to permit the outline of its shape to be most distinctly felt, when the fingers are placed over the part.

The phalanges of the toes are liable to various forms of displacement and *distortion*, from the *pressure of overtight shoes*, for which no remedy but that of *avoiding the cause* will be of any avail ; indeed, in most instances the cause is overlooked, and continued until its *avoidance will not be of much benefit*. One of the most troublesome displacements caused in this way is that when the toe next the great one forms a *sharp angle upwards*, and the skin over it becomes affected with a corn, which is even more troublesome in this situation than on other parts. [See Fig. 2.] The projection is usually seen at the junction between the two proximal phalanges ; it seems to occur most frequently in the originally well-formed foot, in which this toe is a little longer than the others ; and though I believe that a short toe is generally the cause of the displacement, I imagine that there is a natural tendency to it from the slender shape of the part and the influence of the flexor and extensor muscles. The latter seems to draw the distal extremity of the first phalanx upwards and backwards, whilst the former apparently have most effect on the furthest end of the toe, and, by drawing it downwards, increase the displacement. It is seldom that the surgeon is consulted in cases of this kind ; the operation of dividing the flexor tendons immediately under, has been proposed, and I believe the anticipated results might be greatly facilitated were the extensors also cut across above the root of the toe. By using a small knife, such as that afterwards depicted, and taking care to avoid the joints, no danger can result from such operations. Two months ago I was consulted in a case of this kind, which the patient himself (a legal gentleman) considered congenital, his father's foot being affected in a similar manner. I divided the flexor tendons, with the knife referred to, immediately under the proximal phalanx, put a small piece of wood below

the toes, and with some turns of a narrow slip of adhesive plaster kept the two united, when, in a few days, the part was as straight as that on the other foot, and the cure was complete. Sir Astley Cooper refers to a case of a similar kind. The greatest trouble with the toe in this condition is commonly from the *pressure of the upper leather upon the shoe*; but I have seen the part so much bent under the foot, that the patient requested amputation of the offending member, which was accordingly performed."

* * * * * * *

"The surgeon may find it necessary to remove a portion of the nail of the great toe for incurable ulceration at its root and margin. When in this painful form of ulceration (onychia — as it is sometimes called) [*See Fig. 6*] it is found that the usual ointments and lotions with the occasional application of lunar caustic, produce no benefit, there should be little hesitation about removing a portion or the whole of the nail, as may be required, and the proceeding may be accomplished thus:—one blade of the scissors should be thrust upwards between the nail and the soft parts as far as the root (matrix), and then by closing the instrument, the nail is split longitudinally, when with strong, rough-pointed forceps the free end of the part should be seized, and by a twist towards the back of the toe, its removal will be effected; next, if it is necessary, the other half may be twisted in the same manner."

ELEMENTS OF SURGERY;

BY ROBERT LISTON,

SURGEON TO THE NORTH LONDON HOSPITAL, PROFESSOR OF
CHEMICAL SURGERY, ETC., ETC., ETC.

1842.



[Fig. 6.]

“ The term *Onychia* is sometimes, and not without good reason, designated *maligna*: it is applied to ulceration about the nail.— Some of such sores are small, and not indisposed to heal; others are very obstinate. They occur at all periods of life, frequently during infancy. They usually commence in a small and irritable tumor, or granulation by the side of the nail, or at its root, with swelling and redness around. This may follow bruises or laceration and removal of the nail, extravasation under it, and various injuries of the part. The disease is also met with in the toes, most frequently the great one, causing much lameness; then it is generally owing to the *pressure of tight shoes*. In many cases the ulceration is extensive, shreds of the nail projecting through the angry surface; there is considerable loss of substance; the discharge is thin, bloody, acrid, and abominably fetid; the edges of

the sore are jagged, and the integuments around are of either a bright or dark red, according to the state of the disease. Sometimes the bone is exposed and involved in ulceration; or, instead of having lost substance, it is found of an unusually spongy and open texture, and with recent osseous matter superadded. A violent burning pain attends the disease when advanced; the absorbents are irritated and inflamed, and the glands enlarge along their course. The general health is often impaired in consequence; frequently the disease occurs in those of broken-up constitution, along with sores and eruptions on other parts of the surface, ulcerations of the mucous membranes, and other indications of cachexia.

By judicious exhibition of purgatives, anti-bilious medicines, and preparations of sarsaparilla, and by regulation of diet, the general health may be improved. The edge of the nail, when in contact with the ulcerated surface, must be removed—more especially when the *great toe* is affected; not that any undue growth is the cause of the disease, but because the sore, pressing on the sharp edge, produces much pain, and keeps up the morbid action.—About one-third in breadth of the nail should be taken away; one blade of strong and sharp-pointed scissors is passed along beneath the nail as far as its root, and by rapid approximation of the other blade the part is divided; the isolated portion is then laid hold of by dissecting forceps, or small, flat-mouthed pliers, and pulled away by the root. This should be performed as quickly as possible, for the operation, though trifling, is attended with most acute pain; it is quite effectual, the relief is great, and almost immediate. The nail may also be removed by scraping and paring; but this method is not so effectual as the preceding, and almost equally painful. Afterwards the best application to the ulcerated surface, as to other irritable sores, is the nitrate of silver, either used solid and followed by poultice, or employed in the form of lotion. The remedy is almost specific; very few cases prove obstinate under it. Sometimes it may be of advantage to alternate it with

black wash. In protracted and unyielding cases, removal of the whole matrix of the nail has been proposed; the dissection is painful and tedious, and its efficacy doubtful. When the sore is of a weak character, discharging a glairy secretion, studded with soft flabby granulations, connected with unsoundness of the neighboring cellular tissue, surrounded by undermined integument, and by considerable boggy, soft swelling, free application of the caustic potash is highly beneficial. When the bone is denuded, and involved in ulceration, the phalanx should be amputated.

When the extremity of the metatarsal bone of the great toe is large, and consequently the *seat of pressure*, a bursal formation is produced in the soft parts covering it; this from increase of pressure, or other irritation, may inflame—forming the painful and troublesome disease termed *Bunion*. Sometimes unhealthy abscess occurs, with thickening, infiltration, and condensation of the surrounding cellular tissue; in such cases incision and poultice are required, and occasionally it is necessary to destroy the unsound cellular tissue and the degenerated cyst by free application of the caustic potash.”

A T R E A T I S E
ON
DISLOCATIONS AND FRACTURES OF THE JOINTS

BY SIR ASTLEY COOPER, BART., F. R. S.

Sergeant-Surgeon to the King, etc.

1851.

“ DISLOCATION FROM CONTRACTION OF THE TENDON.—A toe is sometimes gradually thrown out of its natural direction, by a contraction of the extensor tendon and theca ; and the first and second phalanges are consequently drawn up and projected against the shoe, so as to prevent the patient from being able to take his usual exercise. [*See Fig. 2.*]

I have frequently seen young ladies subject to this inconvenience in the toe, and attribute it to the *tightness of their shoes* ; it appears an extremely harsh measure on the part of the surgeon, to amputate a toe under such circumstances ; yet it is sometimes absolutely necessary, as the contraction deprives the person of exercise, and of many of the enjoyments of life. In the first person I saw with this state of the toe, I refused to amputate, fearful of tetanus being produced by the operation ; but the lady went to another surgeon, who complied with her request, and she did very well. In consequence of the perfect recovery of this lady and the comfort she derived from the loss of the annoyance, I was induced, at the request of Mr. Toulmin, of Hackney, to remove from Miss T., a patient of his, one of her toes, which was constantly irritated by the pressure of her shoe in walking, and prevented her from taking the exercise necessary to the preservation of her health ; she did very well, perfectly recovering the use of her foot.”

PRINCIPLES AND PRACTICE
OF
MODERN SURGERY;
BY ROBERT DRUIT.

Fellow of the Royal College of Surgeons.

1852.

“WEAK ANKLES.—In this affection the *foot is flattened, its arch is sunk*, and the astragalus forms a projection below the internal malleolus, rendering the internal border of the *foot convex instead of concave*. [See Fig. 4.] In bad cases the inner ankle almost touches the ground, and the patient walks with great pain and lameness. This affection depends on a weakness and relaxation of the *bones and ligaments*. It is sure to be brought on, if weakly children are put upon their legs too soon. It is more common amongst girls than boys—partly from their greater delicacy—partly because they are taught at an early age by ignorant governesses and dancing masters, that it is necessary for them to turn their feet out as much as possible, as the very first step towards elegance in dancing or walking. Thirty years ago it was a common practice to make school girls sit for an hour every day in a kind of stocks, with their feet turned outwards, so as to be almost in a straight line with each other.

Treatment.—The patient should wear *shoes or boots with high heels*, and with the inner edge of the sole much thicker than the outer. He should also be directed to turn the foot out very little, if at all. Benefit may also be derived from a well applied bandage. It should always be applied so as to be carried round the

ankle from the inner side of the foot. In severe cases the patient should wear a tightly-fitting boot with a piece of steel or whalebone fastened to the sole and passing perpendicularly upwards to the middle of the inner side of the leg.

CONTRACTION OF THE TOES.—It often happens that one of the toes is permanently elevated, and rides over its neighbors, from the habitual use of *narrow boots* [See Figs. 1, b, and 2.]; and the upper surface of this toe being peculiarly exposed to friction, is generally covered with corns so painful that many persons have been compelled to have the part amputated. Division of the extensor tendon may, however, enable the toe to be brought down into its place, and prevent the necessity of its removal.

BUNION.—A bunion signifies a *distortion* of the metatarsal joint of the *great toe*; which is thrown outwards, so that the head of the metatarsal bone projects, and forms a swelling on the inner side of the foot. The skin covering it is generally very thin; sometimes, however, thickened from inflammation, or from the development of a bursa underneath. *This affection is produced, partly by the use of tight boots, which cramp the toes together, and force the great toe outwards, in order to make the foot fashionably pointed;—and it is partly a consequence, as Mr. Key has shown, of a weak, flattened state of the foot, which throws the extremity of that metatarsal bone forward, and the toe outwards.* The ligaments of the joints are thus *stretched and thickened*, the joint is rendered unnaturally prominent, and subjected to pressure and friction, a bursa forms over it, and there is a constant state of tenderness and pain, subject to fits of inflammation. [See Figs. 3 and 5.]

Treatment.—The patient must wear *proper shoes*, so arranged as *not to press on the tender part*. Mr. Key recommends the great toe to be kept in its proper place by means of a partition in the stocking, like the finger of a glove, and a partition of strong cow's leather fixed in the sole of the shoe. But it is almost an impossibility for a person who walks about to use such contrivances. A mercurial plaster on soft leather often gives great comfort. If the

bursa inflame, it must be treated by rest, leeches, and poultices, in order to avoid suppuration and the necessity of a puncture, which is sure to lead to an inveterate fistula ; for which, Mr. Key says, that a weak solution of creosote is the best application.

ULCERS ABOUT THE NAILS.—A very common and troublesome affection is that which is popularly termed “ *the growth of the nail into the flesh,*” and which most usually occurs by the side of the great toe. It does not, however, arise from any alteration in the nail, as its name would imply, but the contiguous soft parts are first swelled and inflamed by constant pressure against its edge, from the use of *tight shoes*. If this state be permitted to increase, suppuration occurs, and an ulcer is formed with fungous and exquisitely tender granulations, in which the edge of the nail is embedded, and which often produces so much pain as totally to prevent walking. [See Fig. 6.]

Treatment.—The objects are, to remove the irritation caused by the nail, and reduce the swelling of the soft parts. In most cases, if the nail, having been well softened by soaking in warm water, is shaved as thin as possible with a knife, or file, or bit of glass, the pain and irritation may easily be allayed by rest for a day or two, with fomentations and poultices ; and then any ulcer that has formed will soon heal, with the aid of black wash on lint, or a touch of lunar caustic, or a lotion of a grain of sulphate of copper to an ounce of distilled water. But if the case is more obstinate, the edge of the nail must be removed. This frightfully painful operation may be done by passing the sharp blade of a pair of scissors resolutely under the nail, cutting it through, and then quickly tearing away the offending portion with forceps. If the complaint return after this, the whole nail had better be dissected out, together with the gland that secretes it. Persons disposed to this affection should wear *loose shoes*, and keep their nails scraped rather thin, so that they may be flexible.

IMPROVED LASTS
FOR
BOOTS AND SHOES;

PATENTED JULY 17, 1860,

By J. C. PLUMER, M. D., PORTLAND, ME.

Selections from the Specification.

"THIS invention has for its object the construction of Lasts for Boots and Shoes in a novel manner, and in such a way that the entire bottom of the Last will correspond to the *bony and ligamentous* structure and conformation of sole, back, and heel of the natural or normal foot, so that a shoe produced upon such a Last will prevent distortions and deformities of the foot or joints of the foot, callosities upon the toes, etc., and *relieve and correct* them where they already exist.

The invention provides for pressing the plantar tissues or cushion of the hollow portion or groove in the arch of the foot, against the metatarsus, causing a separating or spreading effect laterally upon it, thereby preventing compression of the anterior tarsal, metatarsal, or phalangeal bones. It also provides for affording a constringing support around and longitudinally to the arch and sides of the foot, at or under the astragalo and calcaneo-tarsal articulation, or union of the bones of the heel with those of the arch of the foot.

It also provides, by the curved form of the bottom and back part of the heel of the last, for an *advanced position* of the heel of the last, or *heel seat* of the last,—whereby the position of the boot heel is advanced nearer to the front part of the foot, the *shank of the boot is shortened*, and the point of support brought more directly under the line of the tibia, or bone of the leg, rendering a stiff, uncomfortable shank unnecessary.

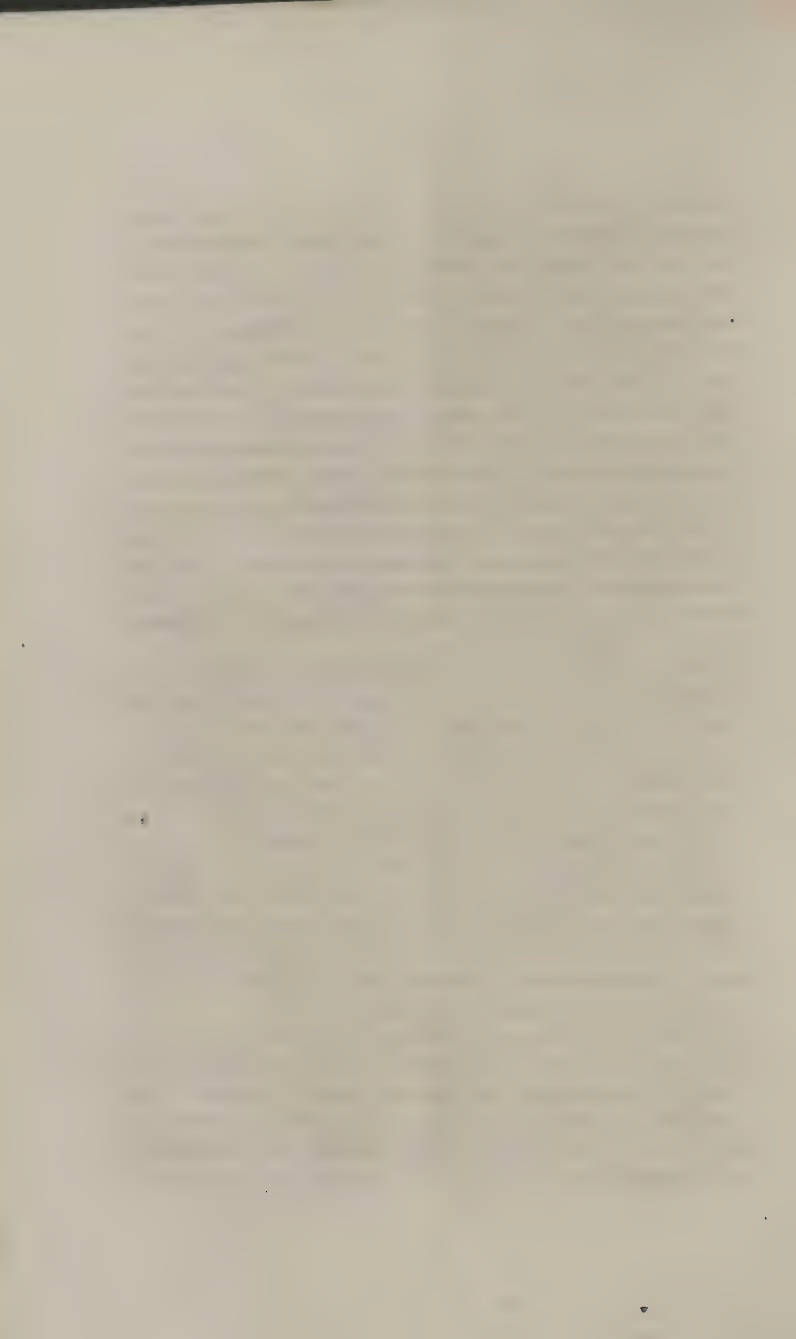
The shape of the lasts that are at present made, produce in

boots or shoes made on them, curves, elevations, and depressions that are contrary or antagonistic to the natural conformation of the bony and ligamentous structure of the sole of the foot, which have a decided tendency to deform the foot, and the results are manifested by the deformities, distortions, callosities, &c., that result from this malformation of the soles of boots and shoes that are at present worn. The surface of the innersole is made concave where it should be convex, the heel seat, if there be any, is thrown back too far from the ball portion of the sole, and consequently the axis of the body is brought nearer to the articulation or joint of the anterior with the posterior portions of the tarsal bones, and the weight of the body over this point dislocates, or stretches the bony and ligamentous structure of the arch of the foot, and the chord of the arch is distended and the foot necessarily flattened, and its natural shape and functions seriously injured.

This invention is intended to obviate these objections, and it consists firstly in making the under surface or sole of the last, laterally concave from the front of the heel to the toe of the last.

It further consists in curving the heel portion of the last in such a manner, that a rotundity will be formed corresponding to the posterior extremity of the os-calcis or heel bone with its ligamentous attachments, which will give the heel an advanced position, diminish the length of the shank, and bring the point of support nearer to the line with the axis of the tibia and fibula or bones of the leg, affording ease and giving antero-posterior support to the heel of the foot, and supporting the foot to a great extent at the astragalo and calcaneo-tarsal articulation, as will be hereinafter described and represented.

It further consists in combination with the advanced heel seat in constricting laterally, that portion of the last in the middle of the arch, corresponding to the fleshy portion surrounding the astragalo and calcaneo-tarsal articulation, making it conform and adapting it to this part so as to give a uniform pressure upwards and bi-laterally, as will be hereinafter described and represented."



THE
MECHANICS,
MECHANICAL ANATOMY,
AND
MECHANICAL DISTORTIONS
OF
THE BONY STRUCTURE
OF
THE HUMAN FOOT.

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PORTLAND:
PRINTED BY BROWN THURSTON.
1860.

Entered according to Act of Congress, in the year 1860.

BY J. C. PLUMER, M. D.,

In the Clerk's Office of the District Court of Maine.

P R E F A C E .

Only the more serious, congenital deformities of the human foot, such as the varieties of CLUB-FOOT, &c., have generally engaged the attention of surgeons. Many of whom of eminence, among them Ferguson, Liston, Druit, Astley Cooper, and others, have alluded to the more important *mechanical distortions*, such as BUNION, SPLAY-FOOT, &c., with suggestions as to the proper surgical treatment required. Sir Benj. Brodie, in his "Clinical Lectures," has devoted an entire chapter to "*corns and bunions*," and their treatment, (*from the works above referred to, Vol. 1, is a compilation,*) but none of them have commenced with the cause of very many of these troublesome distortions, the shoemaker's last. So long as Boots and Shoes are fashioned upon blocks of wood having no features in common with those of the foot, they must, as a matter of course, produce distortions upon the feet of the wearer.

If "the *cut* of a shoe is not, as the cut of a coat, a matter of indifference," most certainly the *form of the last* should not be a subject of fashionable change, especially in its important qualities.

If "when fashion prescribes an arbitrary form of a shoe, she goes far beyond her province, and in reality arrogates to herself the right of determining the shape of the foot," how is it when she prescribes the form and proportions of the last upon which the shoe is moulded ?

At present, the *last-maker* produces a *fashionable last*, and from it, the *boot-maker* a *fashionable boot*, and our feet, alone at fault, in the estimation of both last and shoe-maker, have to suffer ; for if the boot is not made to fit the foot, the foot must be made to fit it, and in doing this the foot is distorted.

In order for a boot-maker to have "a really nice perception of what he is to undertake," the *surgical* instrument he is to construct, he should have some knowledge of the anatomical mechanism of the human foot, especially of the solid structure, and should "study the habits of the individual foot, manner of stepping, whether natural and free, or restrained, and whether inward, or outward, or straight-forward.

The line of direction, and distance from the *heel*, of the ball or

joint of the *great toe*, should be carefully considered, for "upon it, the weight of the body turns at every step." And the relation of the corresponding points in the sole of the shoe is important to a firm, elastic, and easy tread, as well as to the economical wearing and comfort of the boot.

That boot and shoe making, and the requirements and abuses of the foot, are subjects upon which the people should be better informed, and upon which more attention bestowed, does not admit of question. A properly constructed boot or shoe is essential to thorough muscular development and health; for without them healthful exercise is tedious, if not impossible.

In distortion of the foot, the Chinese are, as a nation, content with a less degree than ourselves, their idea of elegance requiring but one especial deformity; viz., bending under of the toes against the palm of the foot, for the purpose of shortening it.

We are satisfied with nothing less than a general distortion of the entire foot, in all its joints and throughout its entire construction, and also of the ankle joint.

Dislocation of the great toe joint, or *BUNION*, inversion of the transverse, and flattening of the longitudinal arch, or flat and splay foot, are the degree of distortion required by us, and for the gradual production of which our common shoe is an instrument which cannot be surpassed by any one however ingenious, or whatever his cleverness in mechanics, or knowledge of anatomy.

The object of this pamphlet is to call attention to some of the more important mechanical distortions with a view to the ultimate removal of their cause.

And this is to be accomplished only by the exactions of public sentiment, for so long as the shoemaker receives his accustomed patronage and attending profit, he is satisfied with his own productions, and quite disinclined to the inconvenience of innovations, and substituting other for his own models, simply for the benefit of his patrons; even if he is sufficiently intelligent and unbiassed to appreciate an improvement.

Many of the diagrams are intended exaggerations with the view of rendering the principles involved more appreciable to all.

PART FIRST.

THE

METATARSO-PHALANGEAL,

OR

TRANSVERSE ARCH.

In flattening, or *inversion*, of the transverse arch, as represented in fig. 12, the metatarsal and phalangeal, or, *toe bones*, by gliding down the laterally inclined planes of the *boot-sole*, to the centre C, are approximated or crowded together, producing compression and atrophy of the tissues lying between them, and destroying the elasticity of this portion of the foot. All this is aggravated, as well as the tendency to subluxation, or BUNION, the production of callosities upon the toes, sides, and sole of the foot, especially beneath the joints; by placing the *boot-heel* so far behind, (the line of axis of the TIBIA *a. a.*, fig. 1, 2, 3, P. 2nd.) as to throw an undue proportion of the weight of the body upon this portion of the foot, and exert through its wedge or lever effect, (fig. —,) a pushing forward of the foot into the boot or shoe.

(Figs. 1 to 9 inclusive, part 2d.)

TRANSVERSE ARCH.

FIRST.

Of the subluxation of the first METATARSO-PHALANGEAL ARTICULATION; or,

BUNION.

FIG. 1

Represents the outline of the *bony structure* of the natural foot in its integrity, with the bones of each toe in their normal, relative position.

FIG. 2

Represents the outline of the common *boot-sole* "*too narrow and pointed for the part it is to contain.*" (Vol. 1, pp. 4 and 9.)

FIG. 3

Represents the relation of the *narrow and pointed sole* to the *bony structure* of the well formed foot. The effect upon the foot, of wearing which, is seen in

FIG. 4

Outline of the bony structure of the foot distorted by subluxation of the FIRST METATARSO-PHALANGEAL ARTICULATION, or great toe joint, an essential anatomical and mechanical condition of BUNION. (Vol. 1, pp. 7, 9, 11, and 20). Also the cause of "*ingrowing toe nail.*" (Fig. 6, Vol. 1.)

Fig. 1



Fig. 2.

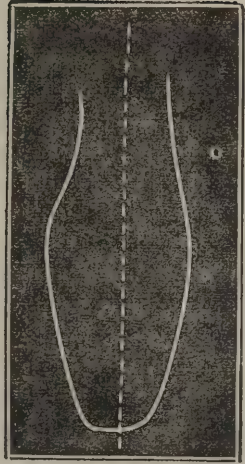


Fig. 3.

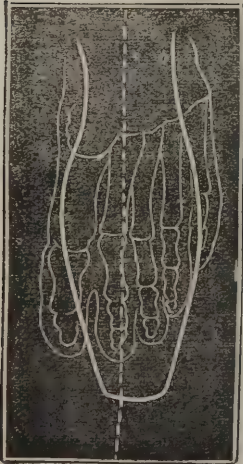


Fig. 4.



TRANSVERSE ARCH.

FIG. 5

Represents a vertical transverse section of the ball portion of the

Common Last,
convex on the under surface,

FIG. 6

Represents a vertical transverse section of the ball portion of the

Patent Last,
concave on the under surface.

FIG. 7

Represents a vertical transverse section of the ball portion of a
boot, from the

Common Last, showing S.,
Concave on its upper, and
the sole, *Convex on its under surface.*

FIG. 8

Represents a vertical transverse section of the ball portion of a
boot from the

Patent Last, showing S.,
the sole, *Convex on its upper and*
flat on its under surface.

Elevation F., fig. 8, affords uniform support to this portion of the sole of the foot, and prevents lateral gliding motion and treading out or inwards of the foot; important to the even and economical wearing of the boot.

(Figs. 9, 10, 11, and 12.)

Fig. 5.

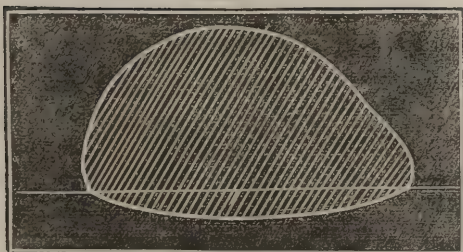


Fig. 6.

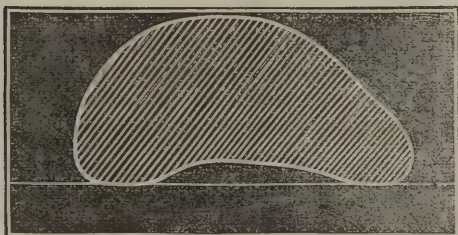


Fig. 7.

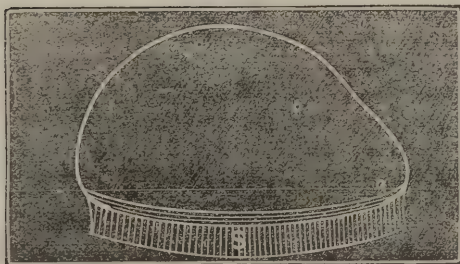
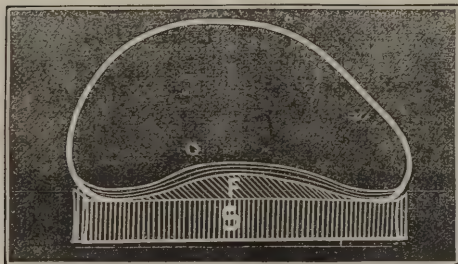


Fig. 8.



TRANSVERSE ARCH.

INVERSION OF THE

METATARSO-PHALANGEAL, OR TRANSVERSE ARCH.

FIG. 9

Represents a vertical transverse section of the natural foot near the METATARSO-PHALANGEAL ARTICULATIONS, or *transverse arch*. B., bony structure; lines a. a. show the arched form of this portion of the foot.

FIG. 10

Demonstrates the adaptation of the *boot sole* S. *transversely convex* on its upper surface (formed upon the PATENT LAST, fig. 6), to this part of the sole of the undistorted foot, affording uniform support and preventing callosities upon, and distortion of the joints.

FIG. 11

Demonstrates the antagonistic relation of the *boot-sole transversely concave* upon its upper surface, (made upon the common last, fig. 5) to the sole of the well-formed foot. The concave sole is opposed to the *naturally* concave surface of the foot, and the space C. resulting, the only bearing points of that portion of the foot upon the *boot-sole* being at J. J., the joints of the great and little toes; the "breaking in" of the boot, as will be readily comprehended, consists in part, in pressing and flattening the sole S. to the floor F. In attempting this upon a thick, unyielding sole, the parts suffer from undue pressure and become the seat of painful callosities, (Vol. 1, fig. 1, a).

The margins alone of the foot resting upon the *sides* of the concave at J. J., an ellipsis is formed represented by lines L. L. and l. l., the middle portion of the foot being unsupported the unavoidable tendency is flattening, which is represented in

FIG. 12.

PLATTENING OR INVERSION,

of the METATARSO-PHALANGEAL or transverse arch, indicated by the inverted curve, and produced by wearing the unyielding boot-oles formed upon common lasts.

Fig. 9.

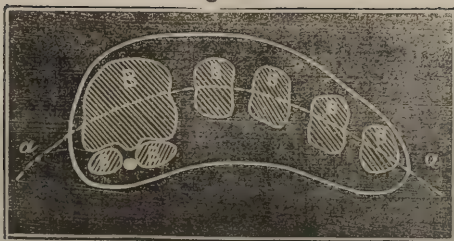


Fig. 10.

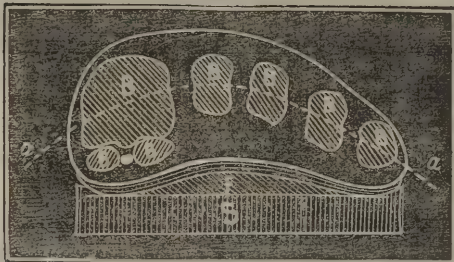


Fig. 11.

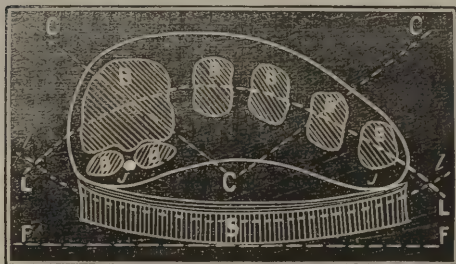
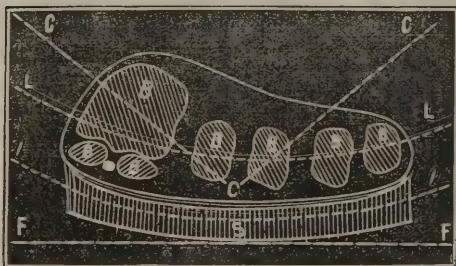


Fig. 12.



TRANSVERSE ARCH.

FIG. 13



Represents the outline of the bony structure of the *bottom or sole* of the foot. B, the under surface of the first

METATARSO PHALANGEAL ARTICULATION,

or *great toe joint, or ball of the great toe.*

H, the heel.

FIG. 14



Represents the *bottom or sole* of the patent last. The *ball seat b*, corresponding with the point B. in fig. 13, should be properly formed, *well defined*, in the *right direction*, and of *suitable distance*, from the *heel seat H* so as to produce by the aid of the workman's hammer a depression upon the upper surface of the in-sole, which shall correspond with and receive the lower rounding surface of the ball of the great toe, and prevent the necessity of producing the depression with the joint itself, in which consists, in part, the "*breaking in*," of the boot, an efficient auxiliary to the production of Bunion.

This depression is both obvious and palpable, upon the upper surface of a boot sole which has been worn for several weeks, and is produced by the pressure, of the under surface of the great toe joint.

PART SECOND.

THE

CALCANEO-TARSAL

AND

TARSO-METATARSAL,

OR

LONGITUDINAL ARCH.

LONGITUDINAL ARCH.

IN FIG. 1,

The resistance to the breaking tendency of 200 lbs. (*the body, Figs. 4 and 7*), is more effectually resisted, with the support H. (*Boot Heel, Figs. 4 and 7*) situated as in Fig. 1, nearer the *line of axis a. a. a.* of the super-imposed weight of 200 lbs. (*the body, Figs. 4 and 7*), than it is in

FIG. 2,

Where the support H. (*Boot Heel, Figs. 5 and 8*) is more removed from the *line of axis a. a. a.* of the super-imposed weight of 200 lbs., (*the body, Figs. 5 and 8*).

The effect of the malposed boot-heel is seen in

FIG. 3,

The structure (*longitudinal arch of the foot, Figs. 6 and 9*), is broken down, the plane of its upper surface (*upper surface of the ASTRAGALUS, Fig. —*), is inclined forward and downward, the weight of 200 lbs. (*the body, Figs. 6 and 9*) is poised forward at an angle with the line of axis a. a. a., taking the direction of the line b. b., (*also Figs. 3, 6, and 9*).

Fig. 1.

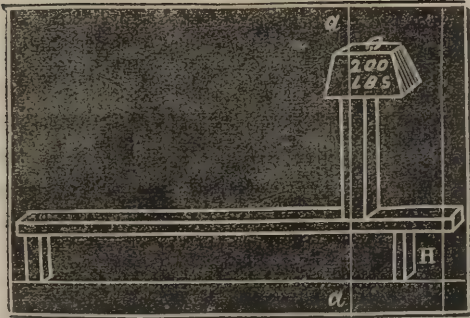


Fig. 2.

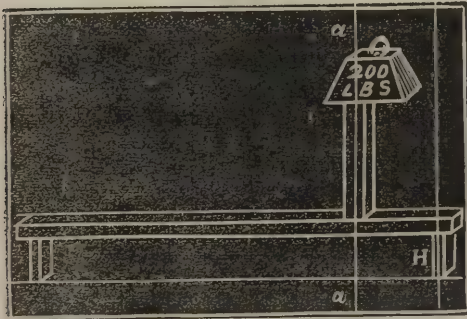
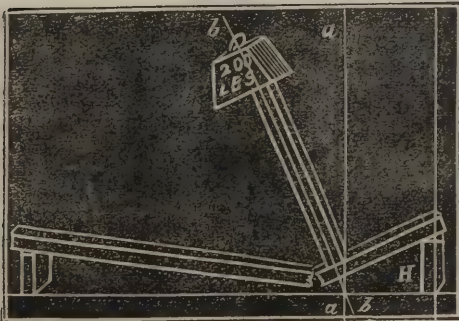


Fig. 3.



LONGITUDINAL ARCH.

Figs. 4, 5, and 6

Represent the outline of a perpendicular longitudinal section of the *bony structure* of the foot and lower third of the TIBIA or *bone of the leg below the knee*, showing the construction of the CALCANEO-TARSAL, and TARSO-METATARSAL, OF LONGITUDINAL ARCH, and in

FIG. 4,

the *proper position* of the boot heel H (*support H, fig. 1*), and its relation to the *line of axis* A. A. A. of the TIBIA.

FIG. 5

represents the *malposition of the boot heel H (support H, fig. 2)*, and its *too remote position, in the rear*, from the line of axis A. A. A. of the TIBIA.

FIG. 6

shows the mechanical effect, and to a certain degree, the unavoidable result, of the malposition of the boot heel H, *too remote* from the line of axis A. A. A. of the TIBIA, worn off on its *front*, pushed back, and exerting a *wedge or lever effect backward and upward* on the OS-CALCIS or heel bone (*fig. 9*), and a depressing or flattening effect upon the TARSAL ARCH or instep at I. in the direction of the double dotted line H. I. causing *flat or splay foot* (*fig. 4, vol. 1*), T. TENDO-ACHILLIS or heel cord.

Double dotted lines L. represent *ligaments and fascias*.

Fig. 4.

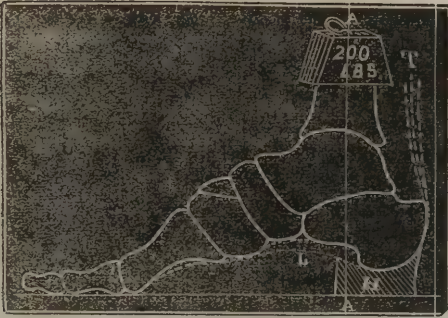


Fig. 5.



Fig. 6.



LONGITUDINAL ARCH.

FIGS. 7 and 8

Represent the joints J. J. J. of the foot and ankle, as consisting of segments of circles of different diameters. The relation of those in

FIG 7,

Where the arch of the foot, or instep is preserved, as represented by the curve L. L. to those of

FIG. 8,

Where the arch of the foot is broken down, and the instep depressed, as represented by the *reversed or inverted* curve l. l., demonstrates the mechanical changes in the relative position of the bones, constituting the arch of the foot or instep. The *breaking down* of the arch is an essential mechanical condition to the affection known to Surgeons as *FLAT OR SPLAY FOOT*, in which the chord of the arch is distended, and the foot elongated. (Vol. 1, fig. 4).

FIG. 9

Is a representation of a boot worn by an individual suffering from that affection, and which must have been an efficient cause in producing it. A cast of the foot, is preserved, also the boot.— The wedge-shaped form, and position which the heel has assumed will be observed, and wedge or lever effect upon the OS-CALCIS, or heel bone, readily perceptible, and is demonstrated in figs. — and —.

FIG. 10

Represents the outline of properly formed boot sole, and the position of the heel, adopted and worn by the individual referred to.

Fig. 7.

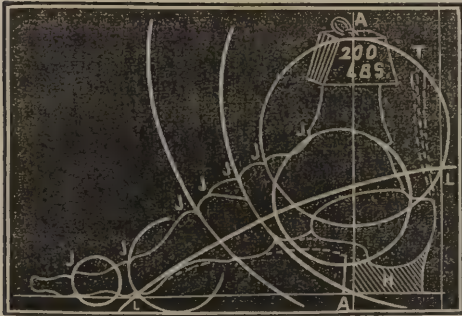


Fig. 8.



Fig. 9.



LONGITUDINAL ARCH.

DEPRESSION OF THE INSTEP.

FIG. 11

Is a representation of the principles of construction of the arch, a common piece of engineering, applied to the *longitudinal arch of the foot*. A. A. abutments, K. the key stone (ASTRAGALUS), receiving the weight, 200 lbs., (*of the body*), and transmitting it to the others, 1, 2, 3, 5, & H, representing the first METATARSAL, CUBOID, SCAPHOID, and OS-CALCIS or *heel-bone*; and H, the *boot-heel*.

FIG. 12

Designed to show the similarity between the construction of the common arch, and that of the *longitudinal arch of the foot*, A. A., abutments; H, the *boot-heel*; K. the ASTRAGALUS (*Key Stone*), upon the upper surface of which the weight of the body (200 lbs), is received and transmitted to the other bones, constituting the longitudinal arch.

FIG. 13

Represents a separation of the abutments, the distance from A to A., fig. 12, being increased to that of B. B., in consequence of which the chord of the arch or *instep*, is distended, the foot flattened, its length increased (fig. 8 and 9,) and the *positions* of the bones changed in relation to the curve L. L. This is a very prevalent mechanical condition of the ~~foot~~, the result of wearing badly constructed boots.

FIG. 14.

An exaggeration of the preceeding; the abutments being separated still further, to C. C., the chord of the arch becoming still longer, as the distance between the abutments is increased. And the arch or instep is depressed and becomes inverted, as indicated by the inverted curve, L. L., not an uncommon mechanical condition of the foot, popularly known as "*weak ankles*," and to the surgeon as "*SPLAY-FOOT*."

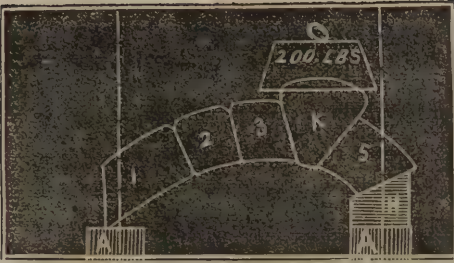


Fig. 11.

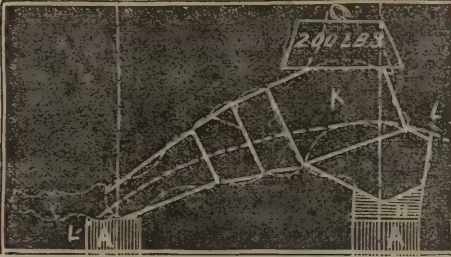


Fig. 12.

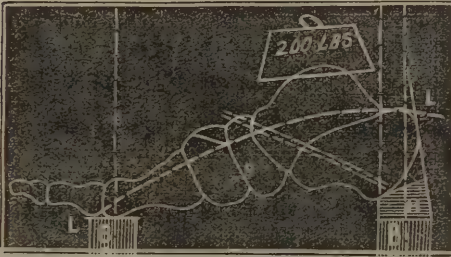


Fig. 13.



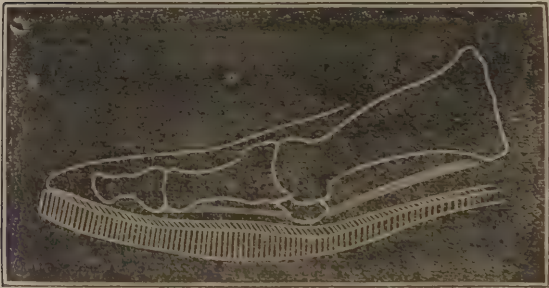
Fig. 14.

LONGITUDINAL ARCH.

FIG. 15

Represents a vertical longitudinal section of the bony structure of the first METATARSO-PHALANGEAL ARTICULATION, or "*great toe joint*," a complicated piece of mechanism, made up off our bones, the first *metatarsal* and *phalangeal*, and two *sesamoid*, analagous to the PATELLA, or, "*knee-pan*." The two former constitute a *hinge joint*, protected upon the lower surface by these sesamoid bones, which form with their fibrous and ligamentous attachments a bedding or foundation, for the reception and support of the rounded head of the first metatarsal bone. Upon this joint the weight of the body turns at every step, and into the depression represented as produced in fig. 14, this bedding is received, and upon which it is supported.

FIG. 15.



IMPROVED LASTS
FOR
BOOTS AND SHOES;

PATENTED JULY 17, 1860,

By J. C. PLUMER, M. D., PORTLAND, ME.

Selections from the Specification.

“ THIS invention has for its object the construction of Lasts for Boots and Shoes in a novel manner, and in such a way that the entire bottom of the Last will correspond to the *bony and ligamentous* structure and conformation of sole, back, and heel of the natural or normal foot, so that a shoe produced upon such a Last will prevent distortions and deformities of the foot or joints of the foot, callosities upon the toes, etc., and *relieve and correct* them where they already exist.

The invention provides for pressing the plantar tissues or cushion of the hollow portion or groove in the arch of the foot, against the metatarsus, causing a separating or spreading effect laterally upon it, thereby preventing compression of the anterior tarsal, metatarsal, or phalangeal bones. It also provides for affording a constringing support around and longitudinally to the arch and sides of the foot, at or under the astragalo and calcaneo-tarsal articulation, or union of the bones of the heel with those of the arch of the foot.

It also provides, by the curved form of the bottom and back part of the heel of the last, for an *advanced position* of the heel of the last, or *heel seat* of the last,—whereby the position of the boot heel is advanced nearer to the front part of the foot, the *shank of the boot is shortened*, and the point of support brought more directly under the line of the tibia, or bone of the leg, rendering a stiff, uncomfortable shank unnecessary.

The shape of the lasts that are at present made, produce in-

boots or shoes made on them, curves, elevations, and depressions that are contrary or antagonistic to the natural conformation of the bony and ligamentous structure of the sole of the foot, which have a decided tendency to deform the foot, and the results are manifested by the deformities, distortions, callosities, &c., that result from this malformation of the soles of boots and shoes that are at present worn. The surface of the innersole is made concave where it should be convex, the heel seat, if there be any, is thrown back too far from the ball portion of the sole, and consequently the axis of the body is brought nearer to the articulation or joint of the anterior with the posterior portions of the tarsal bones, and the weight of the body over this point dislocates, or stretches the bony and ligamentous structure of the arch of the foot, and the chord of the arch is distended and the foot necessarily flattened, and its natural shape and functions seriously injured.

This invention is intended to obviate these objections, and it consists firstly in making the under surface or sole of the last, laterally concave from the front of the heel to the toe of the last.

It further consists in curving the heel portion of the last in such a manner, that a rotundity will be formed corresponding to the posterior extremity of the os-calcis or heel bone with its ligamentous attachments, which will give the heel an advanced position, diminish the length of the shank, and bring the point of support nearer to the line with the axis of the tibia and fibula or bones of the leg, affording ease and giving antero-posterior support to the heel of the foot, and supporting the foot to a great extent at the astragalo and calcaneo-tarsal articulation, as will be hereinafter described and represented.

It further consists in combination with the advanced heel seat in constricting laterally, that portion of the last in the middle of the arch, corresponding to the fleshy portion surrounding the astragalo and calcaneo-tarsal articulation, making it conform and adapting it to this part so as to give a uniform pressure upwards and bi-laterally, as will be hereinafter described and represented."

STATE ASSAYER'S OFFICE, }
Portland, June 15, 1860. }

To Dr. J. C. PLUMER,

My dear Sir :—Several months since, while in the pursuit of my official duties, I had occasion to call at your office. While there, my attention was attracted to sundry diagrams which I saw, and on inquiring their meaning, you explained them, and developed to my understanding an invention of great novelty, and which promised to confer a boon long sought after, but until this never discovered. This was no other than the Last as modified and improved by you, in accordance with an eminently philosophical principle. And when I came to comprehend the invention, it commended itself to my judgment as the only correct plan for the construction of a last, and the making of boots and shoes upon it. So thoroughly confident was I of its entire correctness, that I at once ordered a pair of lasts to be made upon the plan, as designed by you. And without awaiting the result of the experiment, I had my wife and her sister measured also for a pair of lasts each, making three several pairs. The shoes made upon these lasts, were eminently satisfactory. In my own case they were worn with entire ease and comfort, during a recent journey to Washington, and during my stay there and in Baltimore, I walked several miles a day with less fatigue than I ever remember having experienced on walks of similar length before. My wife wore her boots with the greatest comfort, and on temporarily returning to the old style of ladies' boots, was astonished at the difference she found between the new and the old. Her sister who had always been obliged to buy shoes several sizes too long in order to get those she could wear, at length got a boot which fitted her foot, and reduced it to genteel dimensions. In summing up the advantages of the last, or the shoes or boots made upon it, the following

appear to me, evident from my own experience and observation ;

1. An accurate and easy fit.

2. The lines of the last conforming to those bounding the skeleton of a well formed foot, must prevent deformities and appreciably correct them when present.

3. The natural arches of the foot are properly supported, and their development is favored so as to produce a firm and elastic tread.

4. The heel being provided with a hollow seat, where it is firmly set, the foot has not a tendency to slide forward in the shoe or boot, producing pressure upon the nail of the great toe and a liability to the painful disease known as "ingrowing toe nail."

5. No doubt exists in my own mind that some forms of lameness, dependent upon abnormal tension of the ligaments and tissues in the tarsal arch may be effectually relieved by wearing shoes made upon the last as improved by you:

And further experience will no doubt develop further advantages.

In conclusion I would say, that I have reason to believe that the principle suggested to your mind and followed out by careful and patient reasoning and experiment has now for the first time, been PRACTICALLY and FULLY DEVELOPED and APPLIED. It consists as I understand, in conforming the outline of the last to the contour of the osseous and ligamentous tissues of a well formed and developed foot, bringing the point of support more directly in the long axis of the body and limbs, diminishing the amount of leather employed in a shoe to the minimum necessary, and conferring advantages which can be most sensibly appreciated by those who suffer from tender feet.

That you may reap an abundant reward for your careful study and ingenuity is my earnest wish.

Yours very cordially,

H. T. CUMMINGS, M. D.,

Assayer to the State of Maine.

Portland, June 15, 1860.

MR. D. ROBINSON, Jr.,

I have worn with great satisfaction and comfort, the boots furnished by you, and made upon the "Anatomical Last." They were more comfortable to my feet the *first time I put them on*, than a nice pair of boots made upon the common form of last, which I have been wearing for several months.

It seems to me that the invention of Dr. Plumer is as valuable as it is novel. Based upon principles entirely scientific, and applied in a manner quite original, I think his services to the public should be highly appreciated and in some way handsomely rewarded.

Very truly yours, ISRAEL T. DANA, M. D

Portland, Nov. 24, 1860.

DR. J. C. PLUMER,

Dear Sir: — I have been perusing your little book upon the "Mechanics, Mechanical Anatomy, and Mechanical Distortions of the Bony Structure of the Human Foot." By the aid of such numerous and ingenious diagrams, you have made the exposition interesting, clear and conclusive.

I think you cannot fail to reach the *understandings* of the people.

You make your "Patent Last" do what the common last does not begin to do, viz: *correspond to the natural contour* of the *solid structure of the foot*. Notwithstanding that my feet had so often *ached* in testimony to the fact that new boots even "made to order" upon the old last, would not fit, I would not have believed that the old form of last could be so faulty as the comparison of it with the new has demonstrated it to be.

The *principle* of the "Patent Last" commends itself wholly to my judgment, and I believe it to be as novel as it is excellent.

Boots and shoes made upon it are calculated to *preserve* the natural arches of the foot upon which the facility of standing and walking largely depend, while the use of those made upon the old plan tends to

break them down. I examined the foot of a gentleman yesterday, in whose case the arches had been thus destroyed, and who suffers greatly in consequence. He might have escaped this misfortune had your invention been made fifty years ago. It may do something now to correct the deformity.

It makes the wearing of *thick soles* comfortable to ladies, who have heretofore rejected them to the great detriment of their health.

Boots made upon your Last exert an *equable pressure* upon all parts of the foot, and so must tend to prevent the local congestions and tumefactions so common and so painful, and so often leading to results yet more unfortunate.

A personal *experience* has fully realized high expectations on my part, and such is the universal testimony I have heard from others.

Very truly yours,
ISRAEL T. DANA, M. D.

Portland, Nov. 23, 1860.

J. C. PLUMER, M. D.,

Dear Sir:—It gives me pleasure to add my individual testimony to that of many friends and acquaintances, in regard to your “Patent Anatomical Last.”

Many inventions, which *theorize* beautifully, fall lamentably short in the *practical application*. This discovery is only exceeded in the breadth and strict truth of its scientific basis by the thoroughness and success of its practical application; and, indeed, as in the old legend of Columbus and the egg, we only wonder that nobody *did it before*.

It seems to me that a *fair trial* of this last is all that is necessary to convince the most skeptical of its immeasurable superiority to every thing in this line that has preceded it.

Truly yours,
CHAS. W. THOMAS, M. D.

MR. D. ROBINSON, JR.

Dear Sir:—I am happy to say that the boots made for me several weeks since at your establishment, on the Anatomical Last of Dr. Plummer, are the most comfortable I have ever worn.

Yours truly, S. FITCH, M. D,
Portland, Oct. 5, 1860.

Portland, Me., Nov. 23, 1860.

Dear Doctor—

Thank you for your pamphlet on the “mechanics of the human foot.” The diagrams are, in a great measure, new to me and they are very beautiful and very truthful.

Anatomists have long admired the skeleton of the foot, and Surgeons have carefully analyzed the principles of its construction and the relation of its parts in order, to remedy its frequent distortions and diseases induced by fashionable boots and shoes.

But the idea of conforming the Last to the solid structure of the foot upon the principles of exact science (unquestionably originated by yourself) is destined to revolutionize completely the art of boot making and elevate it, if not to the rank of the fine arts, at least to that of the finest decorative arts.

The important changes you have instituted in the construction of the Last, are calculated not only to avert the evils named above, but by preserving the integrity of the arches of the foot will eminently develop its beauty, strength, elasticity—and these results will induce many to walk much in the open air, who seldom walked before, especially the ladies, and thus an important means of health will become attractive, interesting, fashionable, and consequently universal.

I have had another pair of boots made on the anatomical lasts, and I shall probably never again habitually wear any other kind.

I formerly remembered my Edinburgh shoes with which I walked over the Highlands of Scotland as most comfortable, and the boots made for me in Paris as very

beautiful, but those made upon the anatomical lasts are alone perfect, and with sentiments of real gratitude for the benefits of your invention, I remain

Yours very truly,

Dr. J. C. PLUMER.

S. FITCH, M. D.

Portland, Dec. 7, 1860.

Dear Doctor :—

Permit me to give you my experience in the use of the "Anatomical Last." Since childhood I have suffered from weakness of the ankles, and flattening of the foot, much aggravated by a recent attack of Rheumatism, that left the ligaments so sore as to render walking extremely painful, even in boots which I have worn so long as to fit them as perfectly to the feet as it is possible for boots, made on the old last. In this condition I tried a pair of shoes constructed on the Anatomical Last. I was able to walk in them with the utmost ease. The peculiar form of the sole and heel afforded that support to the plantar arch which it had always needed, and in a short time my feet were in a better condition than they had ever been before.

I most cordially and gratefully acknowledge the benefit which I have received from their use, and shall take every possible occasion to recommend the Anatomical Last to all who, from any cause, find it difficult to get well fitting and easy boots, certain that, after a sufficient trial, they will agree with me in the belief that it is one of the most valuable and useful inventions of the times. I do not hesitate to predict, that it will entirely supersede the use of the old last in no great length of time.

Yours very truly,

W. R. RICHARDSON, M. D., *City Physician.*

J. C. PLUMER, M. D.

From the *Portland Advertiser*, Oct. 25, 1860.

“ WHERE THE SHOE PINCHES.”

Our attention has of late been frequently called to various articles published in the papers of New York and elsewhere, upon the subject of shoes, based upon a book recently published in Germany by Professor Meyer. This author is of the opinion that a vast deal of human suffering might readily be saved, if the teachings of nature and the truths of science were attended to in making clothing for the feet. Corns and bunions are works of art, not of nature, and fashionable boot and shoe makers are the artists. From the *New York Evening Post*, one of the most influential and careful papers in the country, we extract the following paragraphs :

“ Dr. Meyer, the author, is pronounced one of the highest continental authorities on Physiological Anatomy, who has published an important general text on that science, as well as several treatises on the structure of the foot and knee. Certainly the needless sufferings which men and women endure from badly cut and ill-shaped shoes cry aloud for a reform.

Against the prevailing pattern Professor Meyer, in his capacity of anatomist, utters an earnest protest. The cut of a shoe, says the Professor, is not as the cut of a coat, a matter of indifference. “ *When Fashion prescribes an arbitrary form of shoe, she goes,*” he asserts, “ *far beyond her province, and in reality, arrogates to herself the right of determining the shape of the foot.*”

In his opinion the shoemaker ought not only to produce a shoe that does not pinch, but a shoe so constructed that it will give to *a foot distorted by the pinching it has borne already, fair chance of a return to its right shape*, and full possession of its power as a means of carrying the body onward. He tells us that, in measuring a foot for shoe or boot, the first thing to be considered is the place of the great toe. Upon this toe, in walking, the weight of the whole body turns at every step.

The practice adopted by many of having a last made of the *exact size and model of the foot is condemned by Professor Meyer, if the foot has been previously injured in consequence of wearing ill fitting boots or shoes, If a cast be made of a distorted foot and a boot fitted to that, it is bad, because thereby the distortion is confirmed.* It would be much better, therefore, says the Professor, so to form the boot that the conditions of healthy walking are allowed for, and the bones, at least to some extent, *can gradually right themselves.* To a foot shortened by distortion he would fit a shoe adapted to its healthy size.

The subject which has attracted the attention of the German Professor and which is of sufficient practical importance to engage the attention of every one who does not avoid all the discomforts of corns and bunions and distortions generally, by going

barefoot, has been made a special study by one of our own townsmen, who, going further than Professor Meyer, has attempted to perfect a plan for furnishing a boot which shall be elegant in shape while it perfectly conforms to the anatomy of the foot. That the foot was constructed with a view to locomotion is apparent to everybody excepting fashionable shoemakers. In the scheme of Dr. Plumer of Portland, this fact is kept constantly in view. Many of our best known citizens are now wearing boots or shoes constructed upon Dr. Plumer's lasts, and under his superintendence, and they are unanimously of the opinion, that for real use, comfort, and elegance, they are vastly superior to anything which can be made upon the ordinary plan. We append a few extracts from the preface of a pamphlet about to be issued by Dr. Plumer, with the intention of again referring to the subject.

“ At present the *last-maker* produces a *fashionable last*, and from it, the *boot-maker* a *fashionable boot*, and our feet alone at fault, in the estimation of both last and shoe-maker, have to suffer, for if the boot is not made to fit the foot, the foot must be made to fit it, and in doing this the foot is distorted.

In order for a boot-maker to have really a nice perception of what he is to undertake, of the *surgical* instrument he is to construct, he should have some knowledge of the anatomical mechanism of the human foot, especially of the solid structure, and should study the habits of the individual foot, manner of stepping, whether natural and free, or restrained, and whether inward, or outward, or straight-forward.

The line of direction, and distance from the *heel*, of the ball or joint of the *great toe*, should be carefully considered, for upon it, the weight of the body turns at every step. And the relation of the corresponding points in the sole of the shoe is important to a firm, elastic, and easy tread, as well as the economical wearing of and comfort of the boot.

That boot and shoe making, and the requirements and abuses of the foot, are subjects upon which the people should be better informed, and upon which more attention should be bestowed, does not admit of question. A properly constructed boot or shoe is essential to thorough muscular development and health; for without them healthful exercise is tedious, if not impossible.

* * * * *

In distortion of the foot, the Chinese are, as a nation, content with a less degree than ourselves; their idea of elegance requiring but one especial deformity, viz., bending under of the toes against the palm of the foot, for the purpose of shortening it. We are satisfied with nothing less than a general distortion of the entire foot, in all its joints and throughout its entire construction.”

From the New York World.

Gentlemen (and ladies ?) who have pet corns and other pedal grievances, will be delighted at the publication of a work called, " Why the Shoe Pinches," and in which the author, Prof. Meyer, shows boots and shoes are almost invariably ill-shaped, and that beside the crippling deformities more immediately attributed to them, they cause indirectly many injuries to health which are commonly imputed to any cause but the true one.

Professor Meyer builds up his argument on this fundamental principle, that the shape of the shoe ought not to be left to the dictates of fashion, for that would be in fact giving to fashion the right of determining the shape of the foot, it being quite clear that if the shoe differ in shape from the foot, the latter being the more pliable, must of necessity, adapt itself to the shape of the former. He maintains that the great toe plays by far the most important part in walking; that in easing the foot, in the act of stepping, the whole of the sole is gradually unrolled, as it were, up to the point of the great toe; and that the line in which the foot thus unrolls itself passes through the center of the heel, and is in a perfectly sound foot, continuous with the axis of the great toe. In such a foot, also, toes lie in an almost rectangular triangle, whilst one of the commonest distortions caused by shoes and boots of the usual form is the conversion of the rectangular into an isosceles acute angled triangle. Growing-in-nails, gout, chilblains, corns, bunions, and flat foot are among the other evils immediately springing from the same cause. *It is a prevailing belief among shoe-makers that there are primary differences in the structure of the feet: but this is an error. All feet are perfectly alike in the principles of their mechanical construction, and the only differences in our healthy feet are those arising from varying length and breadth.*

In this connection we would call attention to the *Anatomical Last*, patented by J. C. PLUMER, M. D. The peculiarity of this last is that it is conformed to the contour of the body and ligamentous structure of the *sole* and *sides* of the *normal foot*, and *rotundity of the back part and sides of the heel when elevated*. This is pronounced by surgeons and scientific men generally, a novel and scientific principle

From this Last not only a comfortable, but an *elegant fitting* boot is produced, one which requires no " *breaking in*." And it is claimed that for the relief of *tender feet, inflamed instep or joints*, or callousities upon any part of the foot, for the preservation of the natural circles of the foot, insuring freedom from the usual tiresome, straining sensations in standing or walking, and a firm and elastic tread, for the prevention and correction of mechanical distortions, consequent upon wearing badly constructed boots. Nothing equals boots and shoes made from this Last.

Judging from the number and character of the testimonials published by the proprietors, the " *patent last* " has already become the favorite. It is now in use by all the most intelligent boot makers in this and other cities, and important towns, throughout the State, and will very soon come into general use.—Portland Transcript.

From the Eastern Argus, Aug. 15, 1860.

IMPROVED LASTS FOR BOOTS AND SHOES.—We would invite attention to the improved last for boots and shoes, recently patented by J. C. Plumer, M. D., of this city. The inventor claims that it is “constructed in accordance with the *bony* and *ligamentous* conformation of the *bottom* and *back part* of the foot, *when the heel is elevated*, and that boots and shoes made from it will not only *prevent*, but *correct* deformities already existing.”

It is apparent to the most casual observer that a large proportion of persons, resident particularly in cities, are suffering from distortions and deformities of the feet, the result, in many instances, of wearing, from early life, ill-fitting, and badly constructed boots or shoes. The usual shape of the last upon which they have heretofore been made has not corresponded with that of a well-formed foot. Last makers seemed to have directed their attention simply to changes in the fashion of the *upper* and *front part*, comparatively as unimportant as the back of a glove, entirely disregarding the conformation of the foot, and more especially, the sole, the most important part of it.

The shape of the lasts that are at present in general use, says the inventor of the improved last, produces in the *soles* of the boot or shoe made upon them, curves, elevations, and depressions that are opposed to the natural conformation of the *bony* and *ligamentous* structure of the *sole of the foot*, which have a decided tendency to deform the foot while young, and the results are manifested by the distortions and callosities so generally prevalent in consequence of the ill-shaped shoes at present generally worn.

The idea of conforming the last to the *fleshy structure* of the foot is erroneous, since it depends much upon circumstances, certain portions of the foot, especially the *fleshy portion of the longitudinal arch*, becoming like the workman's arm, enlarged by over straining.”

We are informed by the proprietors, that during their experiments for the past few months, several hundred persons have been fitted, and judging from the number and character of the testimonials before us, the matter

is no longer an experiment but a decided success; and that public sentiment will compel the general adoption of the improved last. It is peculiarly important for the young and for those who have the muscles of the feet debilitated from any cause. In such cases the advantages are soon manifest. Feet that are strong and hard may resist the bad effects for a long time, but the continual pressure will finally tell upon the firmest feet, as how many enlarged joints and other distortions will testify. We are right glad to see this improvement. It is based on scientific principles, and we commend it to the attention of all who wish comfortable boots for themselves, and desire their children to grow up with symmetrically shaped feet.

From the Boston Evening Gazette.

WHY THE SHOE PINCHES.—A professor of Anatomy in the University of Zurich, Prof. Meyer, has lately given his attention to a most practicable subject,—why shoes pinch,—a subject on which the disciples of St. Crispin have from time immemorial claimed the exclusive right to judge, even extending their claim to the primary question *whether in fact our shoes do pinch at all*. Professor Meyer has taken the matter up as an anatomist, and a young Edinburgh physician has translated his pamphlet.

As reported by the New York Evening Post, he starts with the fundamental idea that fashion ought to take the cut of the shoe from the form of the foot, and not cramp the form of the foot to suit the cut of the shoe. The first thing, he says, is to consider the great toe, which does most of our walking for us. A line from the point of this toe to the middle of its root would, he says, if continued, pass the middle of the heel; but as boots and shoes are made, the tendency is to twist the toe out of this line. Therefore he claims that the shoe should be made to suit the natural position of the great toe as well as the little toe (which has hitherto had a disproportionate share of the attention of mankind); boots, he says, if made on principle, ought to be so shaped that when a pair are side by side, with the heels in contact, the inner line of the front part of the soles should also be in contact along the whole edge to the end of the great toes, so that if the toes are to be pointed, this must be done by taking away from the outside alone.

Professor Meyer admits that boots made in this way would give us all the appearance of turning in our toes, but concludes that as this is the natural shape of the foot, it must be as elegant in reality as any other shape, besides being more comfortable.

We noticed, a few weeks since, the improved last recently patented by J. C. Plumer, M. D., of this city, and assure the Gazette that from this last not only a comfortable but an elegant boot can be produced. We speak from personal examination and experience in this matter, and are gratified to notice that the same subject has attracted attention in Europe. It is high time. The inventor of this last claims that it is constructed in accordance with the *bony and ligamentous conformation of the sole and back part of the foot* when the heel is elevated, and that boots and shoes made upon it will not only prevent deformities, but correct those already existing, and we think it will do so.—*Eastern Argus*, Oct. 15, 1860.

From the Newburyport Herald of Gospel Liberty, Oct 4th, 1860.

IMPROVED LASTS FOR BOOTS AND SHOES.—We would invite attention to the improved last for boots and shoes, recently patented by J. C. Plumer, M. D., of Portland, Me.

The inventor claims that it is "constructed in accordance with the *bony and ligamentous* conformation of the *bottom* and back part of the foot *when the heel is elevated*, and that boots and shoes made from it will not only prevent but correct deformities already existing."

The shape of the lasts that are at present in general use, says the inventor of the improved last, produces in the soles of the boot or the shoe made upon them, curves, elevations, and depressions that are opposed to the natural conformation of the *bony and ligamentous* structure of the *sole of the foot*, which have a decided tendency to deform the foot while young, and the results are manifested by the distortions and callosities so generally prevalent in consequence of the ill-shaped shoes at present generally worn.

The idea of conforming the last to the *fleshy* structure of the foot is erroneous, since it depends much upon circumstances, certain proportions of the foot, especially the *fleshy portions of the longitudinal arch*, becoming like the workman's arm, enlarged by over-straining.

From the same, Oct. 11.

PORTLAND, Oct. 4th, 1860.

BROTHER CARTER.—I see in this week's paper that you notice Dr. Plumer's improved last for boots and shoes. I will say to all whose feet have been tortured with the old style, that I have tried the new and found relief. And I hope for humanity's sake it may soon take the place entirely of the old style. Why should the feet which God has made, be so tired and suffer so much? Why should they be more weary than other parts of the body? Only because for generations a shoe of Chinese folly has been worn. The price of the new is a half dollar more than the old style. I write this unsolicited, and have no interest in the matter, only as I wish success to everything which gives relief. The attention of all who manufacture shoes is called to this very useful improvement. It will doubtless be for their interest, for where the new style is known, it must take the place of the old.

O. P. TUCKERMAN.

Portland, July 12, 1860.

DR. PLUMER,

Dear Sir :—Having learned the principles upon which your "Anatomical Last" is made, I was favorably impressed as to its efficiency in relieving a difficulty which we all have experienced, who have to walk considerably, viz : severe pain in the feet after much walking. After having worn the boots made upon the "Anatomical Last," I found my anticipations more than realized. I can walk nearly all day without experiencing the above-named difficulty in the least degree. I also escaped the torturing process of *breaking in* my boots, for they were as easy at first as after they had been worn.

Truly yours,

C. H. BURBANK, M. D.
Corner of Congress and Temple Streets.

ROXBURY, Sept. 18th, 1860.

D. ROBINSON, JR. & CO.,

GENTLEMEN:—I am very much pleased with the shoes I had made for myself and my son, from Dr. Plumer's Patent Last, and I propose to send for more soon.

Your obedient servant,

D. G. HASKINS.

From Professor Packard, Brunswick College.

Brunswick, Nov. 5, 1860.

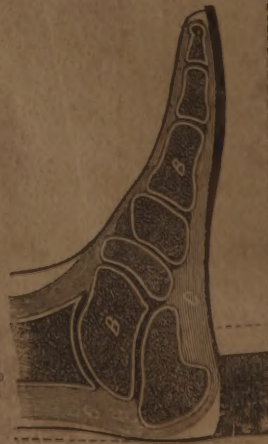
MESSRS E. SHAW & CO.,

GENTLEMEN:—The Shoes were received, and proved, an excellent fit. I never had new shoes so comfortable and judge that the *Anatomical Last* is the one for me.

Respectfully yours,

A. S. PACKARD.

Figure 3.



Figures 3 and 4, perpendicular section, lengthwise of foot and boot; P, bony structure; C, fleshy portion; Dark lines, section of boot.

ANATOMICAL LAST,

(PATENTED JULY 17, 1860.)

Constructed in accordance with the **BONY AND LIGAMENTOUS CONFORMATION OF THE BOTTOM OF THE FOOT**, and of the **ROTUNDITY OF THE SIDES AND BACK PART OF THE HEEL WHEN ELEVATED**. In the **COMBINATION OF THE ELEVATED AND ADVANCED POSITION OF THE HEEL SEAT WITH THE HOLLOW AND CONSTRICTED SHANK AND SOLE**, an entirely **NEW PRINCIPLE** is involved, which constitutes a decided improvement in Lasts for Boots and Shoes.

From this Last a boot or shoe is made very much shorter on the sole than that from the old style, in consequence of the shortening of the shank, and the advanced position of the heel seat, insuring a degree of elegance in fit unequalled by those made upon any other last; and for tender or injured feet, or for persons suffering with corns or bunions, or a depressed instep, or from **DISTORTION OR DEFORMITY OF THE FEET**, of any kind, and for preventing such deformities and injuries, no last has ever been produced that meets the case like this.

Figure 4.

